Atmos. Chem. Phys. Discuss., 7, S189–S193, 2007
www.atmos-chem-phys-discuss.net/7/S189/2007/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Humidity observations in the Arctic troposphere over Ny-Ålesund, Svalbard based on 14 years of radiosonde data" *by* R. Treffeisen et al.

Anonymous Referee #2

Received and published: 14 February 2007

1 Overview

Treffeisen et al. present an analysis of a large radiosonde dataset comprising launches from 14 years in Ny Alesund, Svalbard. The authors study in particular ice supersaturation in the humidity profiles, and the statistical properties of the ice supersaturated layers. Since Svalbard is a peculiar location, and the dataset large, this is a valuable and interesting study worth publishing in ACP after some necessary improvements.

2 Major points

p. 1263, l. 5 The statement “typical stratospheric humidity of a few percent” is at least misleading. Look at your own data in figure 4b: there is quite some ice supersaturation above the tropopause.

p. 1268, par. 3 It seems to me that you have applied the temperature correction twice, although with different formulas, one with 4.5 from W02 and once with M01. This might cause overcompensation, and indeed, the black curves in Fig. 2 show overcompensation (see also text at the and of section 3.3). Are these two correction really additive? Furthermore, is there any correction applied to the RS92?

p. 1269, ll. 18 The statement “However mean RHi...” is probably wrong. Why should RHi vary more than RH. This would need rather peculiar temperature variations. Probably you are misled by the choice of your colour bar. Please check.

p. 1272, ll. 22 The sentence “the local maximum...” should be deleted. The measurement uncertainties are given as $\pm 10\%$, so that just above and just below saturation is not distinguishable.

p. 1273 Here the reader needs more information on the method applied. How do you compare regions inside and outside ice supersaturation layers, since outside here means above or below. Or is it in statistical sense at the same altitude? The finding of warmer supersaturated than subsaturated layers certainly deserves more investigation on the reasons for that unexpected result. Does the mixing of various altitudes lead to this result?

sect. 4.4, 1st par. The text is confusing and I cannot see how it is related to the rest of the section. It should be deleted completely.

ACPD

7, S189–S193, 2007

table 2 left, figure 7 and corresponding text: As you have 14 years of data it may be possible to find out whether the seasonal variation of the b values is statistically significant. I suggest the following procedure to find that out: 1) Normalise the frequency distribution for supersaturation (i.e. compute pdf(Si)), then compute from the pdf the cumulative distributions. Then apply a Kolmogorov-Smirnov (KS) test to pairs of the cumulative distributions. The KS test is described and a routine is given in the Numerical Recipes book for instance (e.g., Press et al., 1990).

3 Minor points

Language Generally write “frequency of occurrence”.

Seasons Why do you divide the year in only 3 seasons (no fall)?

p. 1263, l. 11 Gierens (2004) is cited for a statement that ice supersaturation is due to absence of ice nuclei. While this might be so, there is nevertheless no such statement in that paper. Please correct.

p. 1264, ll. 24 Sentence duplicated.

p. 1266, l. 20 replace “real” by “actual”.

p. 1267, l. 2 replace “different” by “various”.

p. 1268, l. 22 Probably the word “absolute” can be deleted (also in the figure caption of Fig. 2). What you show is simply a difference.

p. 1270, l. 6 “clear air”.

p. 1271, l. 1 better write $p < 10^{-3}$ or similar.

ACPD
7, S189–S193, 2007

EGU

p. 1272, l. 1 Give more details. The reader cannot know what is q and why $b = -\ln q$.

p. 1272, ll. 9 the outdated statement that ice nucleation needs 30% supersaturation should be deleted. The word "affords" should be replaced by "needs" or "requires".

p. 1272, l. 15 MOZAIC

p. 1272, l. 18 "... compares to their results." Something compares always to something else, so this statement is a bit meaningless.

p. 1274, l. 11 Sentence duplicated.

p. 1274, l. 22 "400 m". Please check whether this small variation is statistically significant. If not, leave out the statements and the corresponding figure.

table 1 Please explain in the text what these numbers mean exactly. For instance, does 24 mean that 24 profiles had supersaturation, that 24% of all profiles had supersaturation, or that 24% of all layers above x km had supersaturation. Do not forget the units (i.e. %).

tables 2 and 3 Why do you show temperature differences together with the b values in one table, but humidity differences in the other. This is illogical. It makes more sense to couple the differences together in on table or to have 4 tables.

figure 4 The black CV contours in the figure are useless. First there are open ends within the figure, and second there are other plotting artefacts like loops. Obviously your contouring routine is not able to handle your CV field. So either use a better routine or delete the CV lines.

ACPD
7, S189–S193, 2007

EGU

Reference

Press, W.H., Flannery, B.P., Teukolsky, S.A., and Vetterling, W.T., Numerical Recipes, Cambridge University Press, 1990.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 1261, 2007.